The New Pre-injector (Going from the highest energy to the lowest energy machine)

C.Y. Tan

19 Feb 2010

Let's spend all our money on the engine and body … forget the tyres!

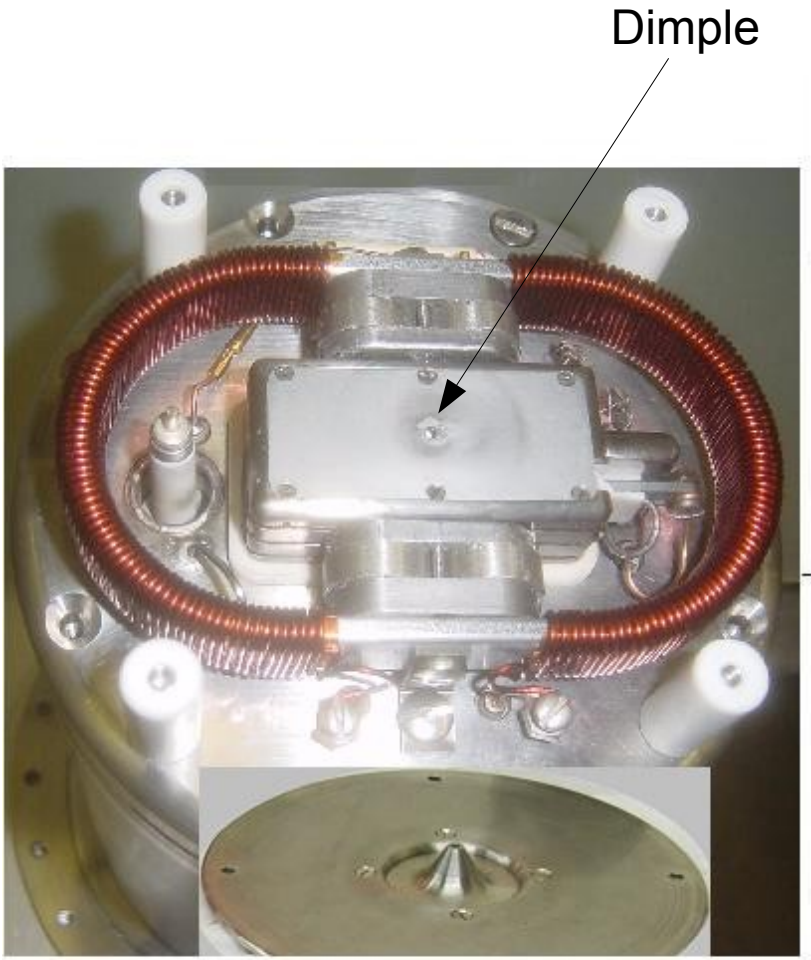
Reasons for replacing the Cockcroft Waltons

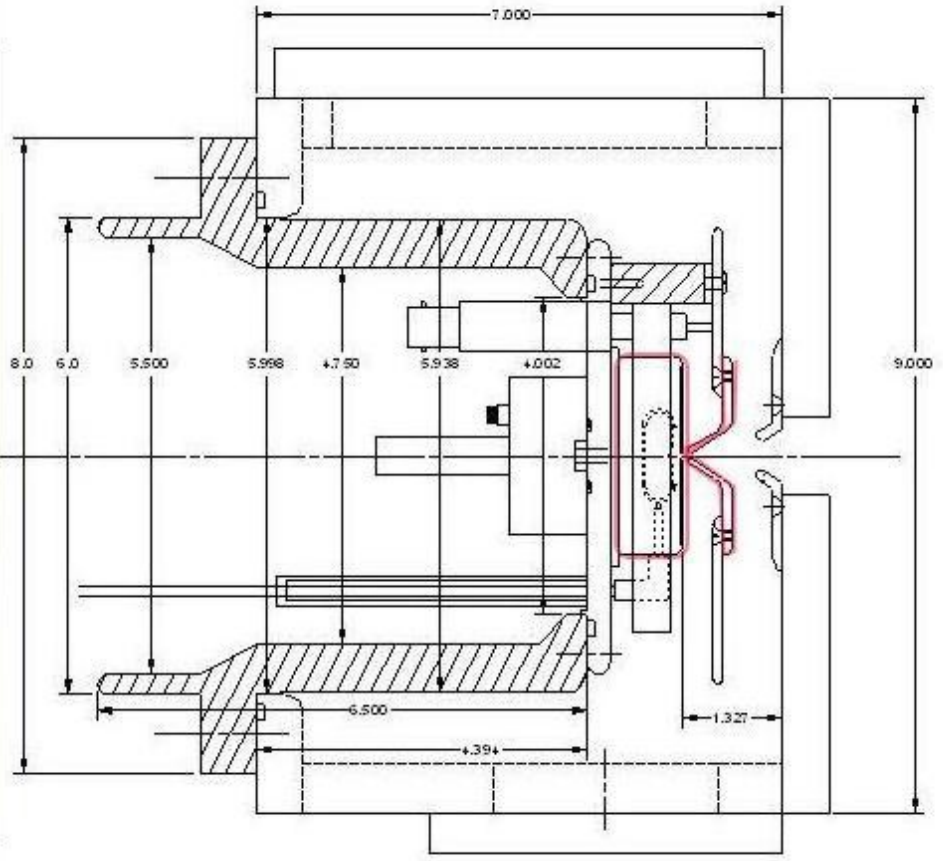
- Systems are over 40 years old.
  - No I- for the last few months (probably from contaminated H)
    - Rebuilt 750kV column
    - Retirement of two key personnel (82 years of experience)
    - Uptime getting harder to maintain
  - Cockcroft Waltons dominate down time (52%)

Why Magnetron Source+RFQ?

- Proven technology
  - BNL retired Cockcroft Waltons in the 1989(!).
    - Has been running reliably with ONE source + RFQ since that time
    - Beam quality and losses are better than Cockcroft Walton (DC versus bunched beam at the start of DTL 1)
  - Magnetron source
    - Dimpled (or round) magnetron source can produce 100mA of H- for 500 us. Our requirement is ~50-60mA for 100 us. Can run for > 6 months!
    - Local expertise with slit magnetron source.
    - Leverage HINS programme.

Round Source



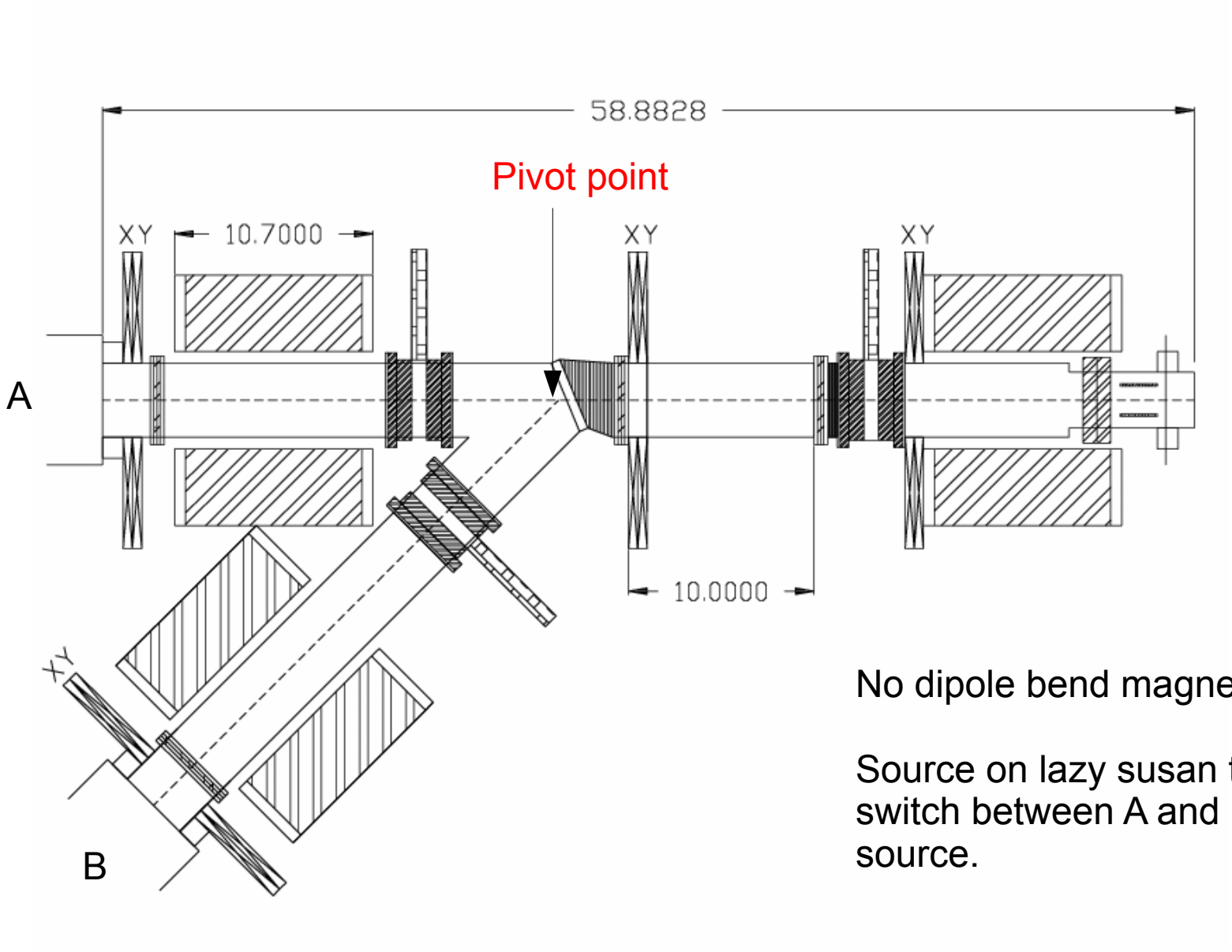


HINS round source very similar to BNL source.
Presently making one.

Some RFQ Params

- Input energy: 35keV H-
- Output energy: 750keV
- Frequency: 200MHz
- Input current < 60mA
- > 97% capture efficiency
- 1.2 to 1.6m long
- ~100kW pulsed.

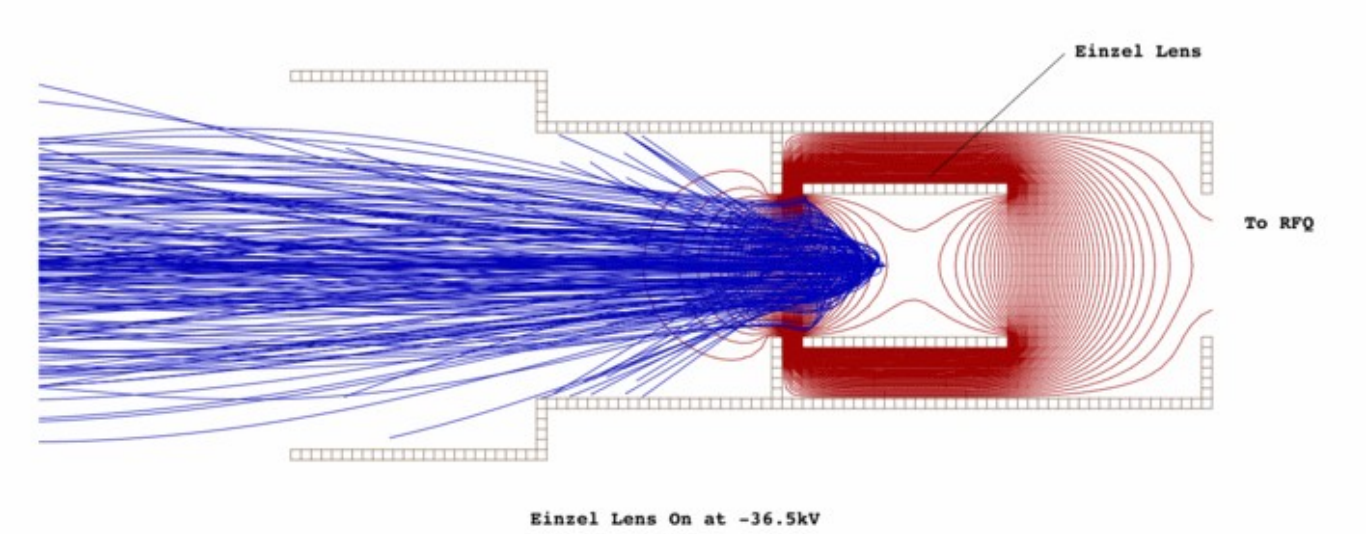
The LEBT

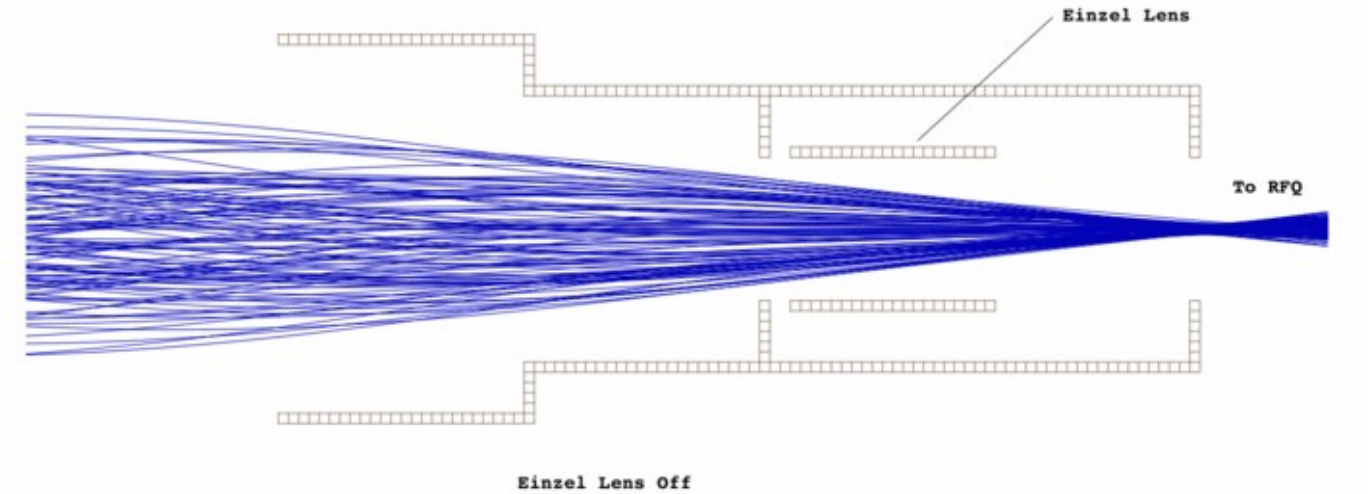


No dipole bend magnet!

Source on lazy susan to switch between A and B source.

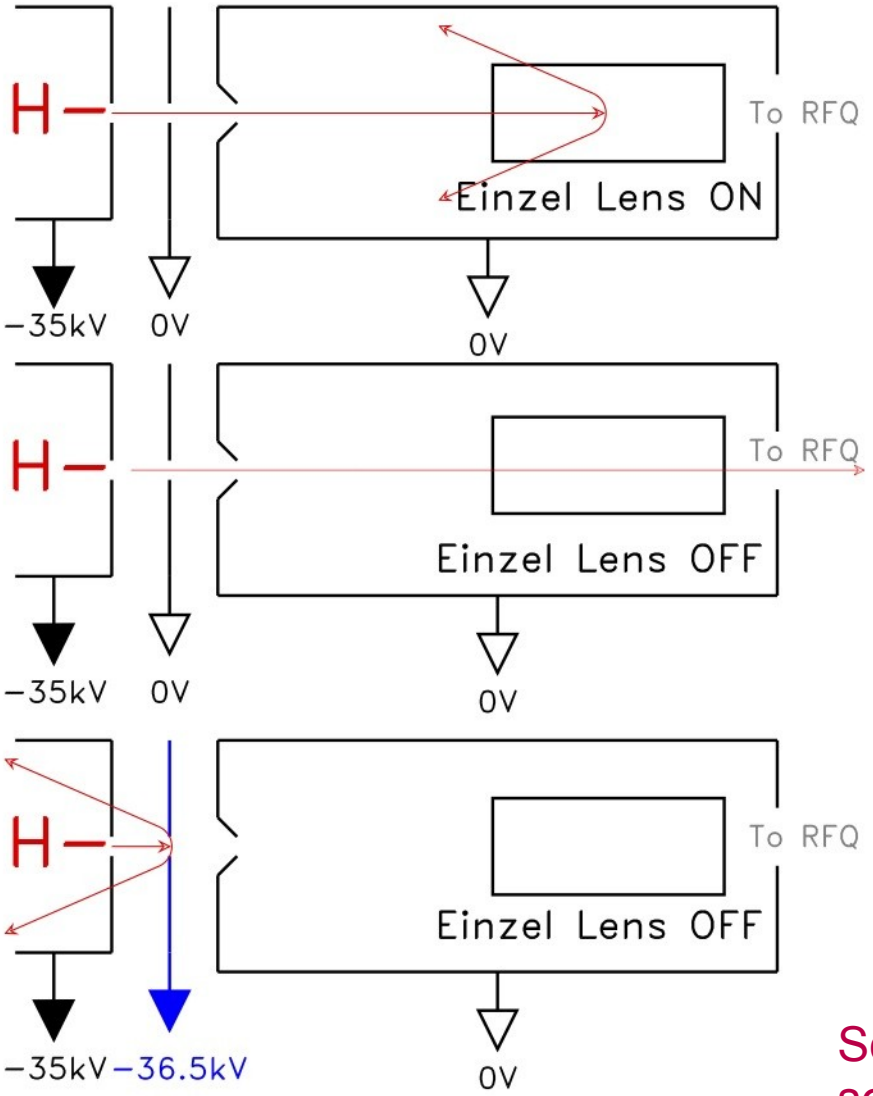
Einzel Lens Chopper





Very close to the end of the LEBT for H- neutralization with Xe gas which takes about 40us.

Possible Source Pulser



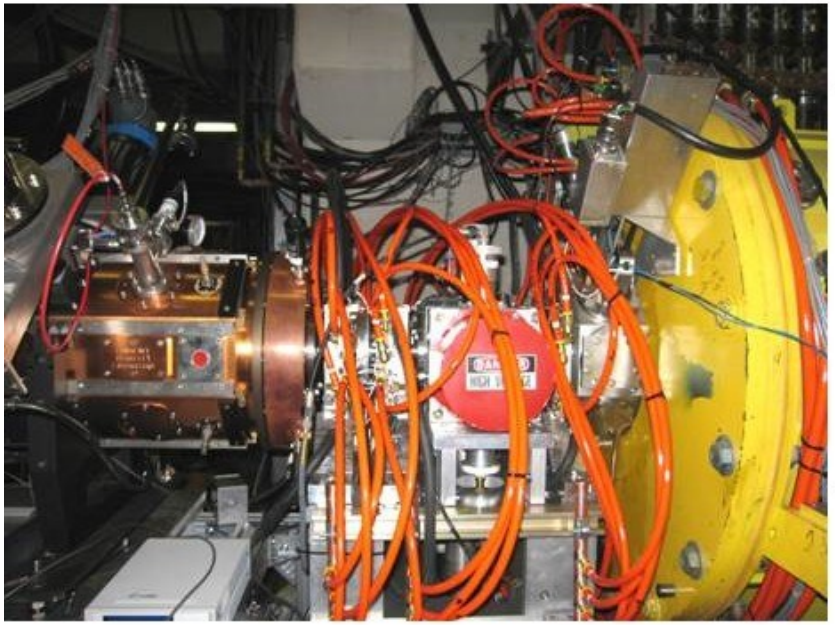
Einzel lens is on for ~40μs to deflect beam which is not completely neutralized

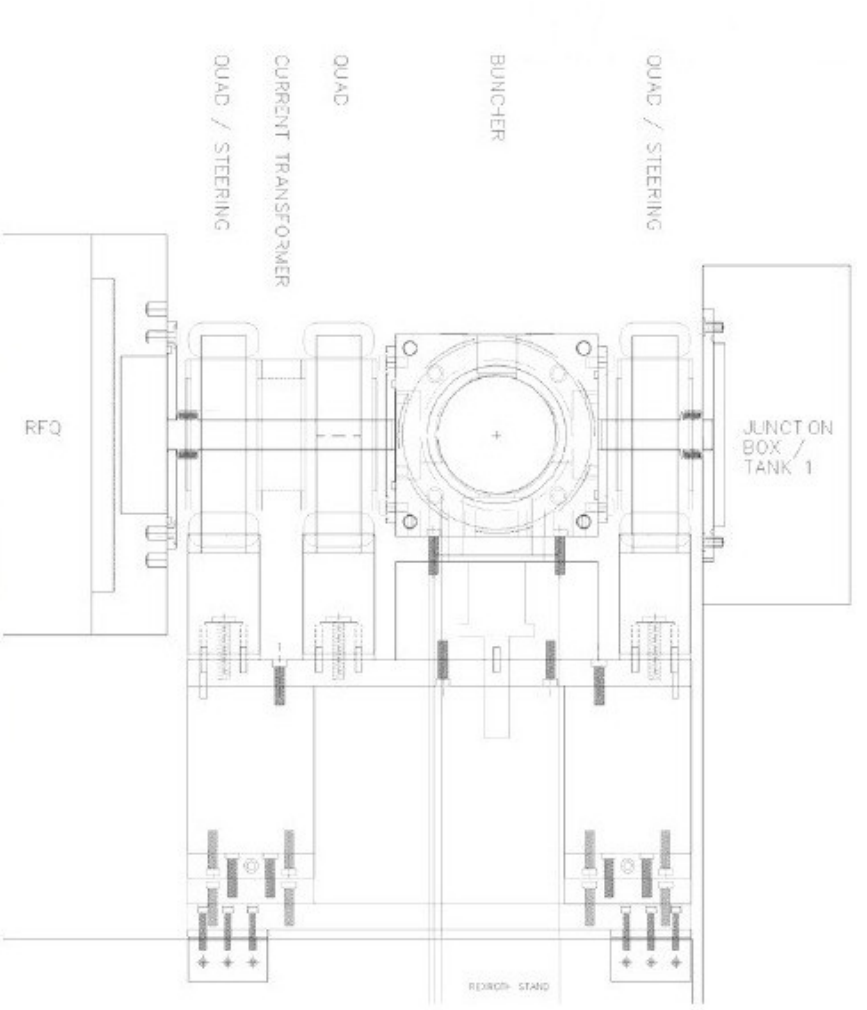
Pulser and Einzel lens off for ~60μs

Source is turned off by pulsing an electrode to −36.5kV

Some tests will be performed soon in H- source test stand.

MEBT (copy BNL)





Status

- RFQ requisition
  - Steve Holmes has it (Ralph owes me dinner/lunch once he signs it --- maybe), got budget codes.
- Solenoids being worked on by TD
- Quads reuse linac quads (maybe)
- Einzel lens and round source will be tested very soon. (March)
  - Some preliminary designs to fit in very small space 4”.